

## **APPENDIX B**

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SURFACE WATER QAPP

COMMENTS ADDRESSED IN THE  
REVISED SURFACE WATER QAPP

Table .1 Requested Changes to Surface Water QAPP and Supportive Comments

Comment No.	Section	Page	Line	Requested Change	Comment	Response to Comment - Proposed Revision
1a	A1	ii		Update names of project management staff	The EPA Project Coordinator is Helen Bottcher. The EPA Quality assurance (QA) manager is Gina Grepo-Grove. We understand that Maja Tritt no longer works at Integral; please correct the name of the task QA coordinator as appropriate.	The text will be corrected as requested; Craig Hutchings is the task QA coordinator and the text will be corrected to reflect this change.
1				Modify sample event timing as indicated in EPA’s cover letter	<p><b>Temporal Variation:</b> Three time periods were selected to address temporal variation. These three were characterized as high pool volume/low flow (September), decreasing pool volume/low flow (May), and increasing pool volume/high flow (June). The sampling design used reservoir operations as the main factor in selecting the time periods to address temporal variability. Contrast that with the general hydrodynamic characteristics used for the selection of spatial variability locations. Reviewer recommends an alternative approach, that would have been consistent with the spatial variability design, would have been to sample at key time periods of the annual hydrograph, such as during the ascending limb, peak, descending limb and during base flow conditions. Many of these time periods would also coincide with reservoir operations, but would also allow the study to differentiate reservoir operation effects from annual changes in flow.</p> <p>As a result of the reservoir operations focus, the design rational for the temporal variation aspects of the study has many confounding hydrological processes occurring. The study design will be unable to separate the changes in COI concentrations from reservoir operations, and furthermore the study design seems set up to test reservoir operations not annual variation in flow regime. Below are the three time period selected by the study and some of the issues with each.</p> <p>A. Summer Draw Down (September 2008). This period was selected due to the brief draw down associated with juvenile kokanee salmon migration (see page B-8 lines 3 through 5). The time period was also meant to represent stable pool volumes and low flow conditions. However, by focusing on the summer draw down the data will not represent that condition, it will represent the brief draw down period. Stable pool volume and low flow conditions typically exist within the study area from September until December (outside of the September draw down).</p> <p>B. Spring Draw Down (May 2009). This period was selected due to the timing of minimal pool volumes (see page B-8 lines 6-8). It was also meant to represent decreasing pool volumes. However, it also corresponds with increasing flows in the study area, and therefore the data will be confounded by sediment reentrainment typical of the processes associated with the ascending limb of the annual hydrograph. In the study area, the transport and entrainment of sediments, and COIs, typically occur on the ascending limb of the annual hydrograph as shown in figures B-22a through B-22f. It is also at this time that pool volume is typically lowest in Lake Roosevelt to make room for flood control. Sampling during these two significant processes will yield important information, but how will the effects of one be separated from the other? By advancing the time period earlier in the drawdown period (March), before flows begin to increase, the study will be able to separate the effects of drawdown. Consequently, an additional sampling event would be needed to separate the effect of changing flows. This event would be timed during the period of increasing drawdown as well as increasing flows (May) and would allow the effects of increasing flows to be separated from the previously studied drawdown effects.</p> <p>C. Spring High Flow (June 2009). This period was selected to coincide with full pool conditions and high flow events of the spring freshet. Sediment and COI transport process similar to the spring draw down sample period are occurring at this time as well. However, these processes are decreasing sediment transport associated with the descending limb of annual hydrograph. During this time period sediment will begin to settle out as sheer stresses decrease. As shown in figures B22a-f, the concentration of many COIs begin to decrease during this period. Again, the analysis seems set up to test what effect the increasing or full pool volume has on COI concentration rather than the hydrological processes.G21</p>	<p>Sampling periods for the proposed surface water sampling program will be adjusted to better account for annual hydrologic flow conditions into the UCR. It is proposed that sampling periods be adjusted to approximately the following periods:</p> <p><b>Sampling Event #1 (October 8–22, 2009):</b> As indicated within Figure SW-1 attached, this event will occur during low flow conditions within the Columbia River as measured at U.S. Geological Survey (USGS) gage Station No. 12399500 and stable pool elevations within Lake Roosevelt.</p> <p><b>Sampling Event #2 (March 28 – April 8, 2010):</b> As indicated within Figure SW-1, this event will occur during the descending limb of the hydrograph and will be completed prior to infilling of Lake Roosevelt.</p> <p><b>Sampling Event #3 (May 27 – June 10, 2010):</b> As indicated within Figure SW-1, this event will occur during the peak of the ascending limb of the hydrograph and will be completed prior to infilling of Lake Roosevelt.</p>

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2				<b>Include in text, as appropriate</b>	<p>The HHRA exposure media of principal concern is disturbed, shallow surface water (includes suspended sediment) collected at depositional areas associated with a subset of beaches slated for sampling. The HHRA will rely primarily on disturbed SW samples for:</p> <p>Inadvertent ingestion while swimming, wading or playing at beaches</p> <p>Intentional (subsistence) drinking water (e.g., filling a bottle directly from the river)</p> <p>Swimmers from a boat may be exposed to undisturbed pelagic SW</p>	Section A7.1.1 <u>Conceptual Model and Data Needs/Uses</u> of the revised document will be modified to specify the disturbed shallow surface water as the exposure media of principal concern for the HHRA.
3				<b>Modify text in QAPP to match work plan</b>	Several surface water-related comments submitted in response to the RI/FS Work Plan apply to the current version of the SW SAP. Specifically, the changes in Sections 5.1 and 5.2 of the RI Work Plan regarding the sources and usability of historical data, comparability of historical data sets, and revisions to text concerning conditions in the Pend Oreille River (the redline version of the RI Work Plan, dated 12/5/08 indicates these changes).	Section A5.2 <u>Overview of Existing Surface Water Data</u> and <u>Appendix D</u> of the surface water QAPP will be reviewed and modified to ensure consistency with the December 2008 RI/FS work plan. The redline-strikeout section on the RI/FS work plan pertaining to the Pend Oreille River (Section 5.2) has been provided by EPA and text will be modified accordingly. Language related to the sources and usability of the data will also be revised to be consistent with Section 5.1 of the RI/FS work plan.
4				<b>Confirm sample design meets these criteria</b>	Disturbed surface water samples should represent temporal, spatial (up river & down river), and water elevation (perpendicular to bank) variability	With the exception of stations located in Canada, disturbed water samples will be collected at each transect along the entire length of the UCR. As a result, spatial variability for these samples is satisfied. Temporal variability will be addressed by including disturbed sediment surface water samples in all three sampling events as discussed in response to comment 20. The proposed elevation of the surface water samples was selected with the specific objective of representing a sample associated with the scenario of incidental ingestion associated with shallow-water recreational activity.
5				<b>Include in text, as appropriate</b>	Exposure point concentrations will be used to estimate long-term (decades) average intake of COPCs	Comment acknowledged. Text at the end of Section A7.5, will be revised to read as follows: "All analytical results will be provided to assess risk to humans <i>associated with short-term or long-term exposure to COIs in surface waters, as described in the HHRA work plan.</i> "
6				<b>Adjust all dates in QAPP to match schedule</b>	<b>Global change:</b> reference to a 2008/2009 surface water study should be modified to address the current anticipated schedule for UCR surface water sampling.	Consistent with response to comment 1, all dates within the revised surface water QAPP will be modified to accommodate the following sampling schedule: sampling event #1 (October 2009), sampling event #2 (March/April 2010), and sampling event #3 (May/June 2010).
7				<b>Clarify sources of SEVs by citing primary literature or other sources if the SLERA is not final by the time this QAPP is being finalized</b>	<b>SEVs.</b> Documentation/citation of the SEVs is needed. Referencing a preliminary, available, but unapproved SLERA is problematic.	<p>Primary literature sources for respective SEVs will be referenced within Section A5.3 <u>Surface Water Screening Relative to Ecological SEVs</u> of the revised QAPP. These include:</p> <p>STI (Spokane Tribe of Indians). 2003. Surface Water Quality Standards. March 7, 2003. Resolution 2003-259.</p> <p>Confederated Colville Tribes. 2004. Water Quality Standards. Title 4 - Natural Resources and Environment, CH. 8-9. Available at: <a href="http://www.narf.org/nill/Codes/colvillecode/cc4ch8to9.htm">http://www.narf.org/nill/Codes/colvillecode/cc4ch8to9.htm</a>.</p> <p>Ecology. 2006. Water Quality Standards for Surface Waters of the State of Washington, Chapter 173-201A. Amended November 20, 2006. Publication No. 06-10-091. Washington State Department of Ecology, Olympia, WA.</p>

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						<p>CCME. 2007. Guidelines for the Protection of Aquatic Life. Canadian Council of Ministers of the Environment. Environment Canada. Available at: <a href="http://www.waterquality.ec.gc.ca/EN/navigation/3297/3301/3307.htm">http://www.waterquality.ec.gc.ca/EN/navigation/3297/3301/3307.htm</a>.</p> <p>USEPA. 2006. National Recommended Water Quality Criteria. Office of Water. U.S. Environmental Protection Agency, Washington, DC. Available online at: <a href="http://www.epa.gov/waterscience/criteria/wqcriteria.html">http://www.epa.gov/waterscience/criteria/wqcriteria.html</a>.</p>
8				<p><b>Include description of quantitative data quality criteria and what limits on decision errors were used in determining sample size</b></p>	<p>The DQO process in the QAPP is limited by our current knowledge of SW quality and is consequently not very specific</p> <p>Quantitative Data Quality Criteria to <i>specify limits on decision errors</i> should be prepared, similar to what was done with beach sediment, to permit a transparent and defensible evaluation of sample size (Woodbury, 2008; Woodbury &amp; Brattin, 2008)</p> <p>The first round of results should be rapidly analyzed to evaluate and <i>optimize the sampling design</i></p> <p>EPA may complete HHRA DQOs, data adequacy evaluation, and optimization, pending discussions with Parties &amp; Teck</p>	<p>When data from multiple samples (e.g. from different locations or depths on a transect) can be pooled, the multiple samples can be treated as replicates for the purpose of comparing concentrations to water quality criteria. In such cases, the comparisons will be carried out using one-sample <i>t</i>-tests, with a one-sided alpha level of 0.05. The target power level for these comparisons will be 80 percent. Analysis of existing water quality data from the monitoring station at Northport indicates that this power will be achieved with sample sizes as small as two. The mean and standard deviation of dissolved metal concentrations measured at Northport since 1999 are summarized in Table 1A, attached.</p> <p>The statistical power for comparison of these data to the Criterion Continuous Concentration (CCC), for sample sizes of 2 to 8 and an alpha level of 0.05, is shown in Table 1B, attached.</p> <p>Although concentrations measured in other parts of the UCR in 2009 may differ from those previously observed at Northport, this analysis indicates that a power of at least 80 percent can be achieved with an alpha level of 0.05. Initial data collection in Fall of 2009 will allow this variability to be assessed, and sampling plans modified if necessary, prior to the next sampling event in Spring 2010.</p>
9				<p><b>Update RI/FS Work Plan schedule</b></p>	<p>Consistency with RI/FS Work Plan. Once the schedule for surface water sampling is approved, the RI/FS Work Plan schedule will need to be updated.</p>	<p>Comment acknowledged. Teck will continue to work with EPA in periodically reviewing and updating the project schedule as the RI/FS progresses. It should be noted that the RI/FS work plan will not be updated.</p>
10				<p><b>Point out limitations, add a discussion of how the resulting data will be used to calculate exposure</b></p>	<p>Restrictions of Sample Area and Size of Exposure Areas. The boundaries of the study design restrict sampling within the extensive Upper Columbia River site. The selection of cross-section area provides an initial restriction. Additional restrictions such as sampling only areas that have a relatively flat bottom eliminate further areas of interest from consideration.</p> <p>In addition, the QAPP should explicitly identify the sizes of exposure areas within which statistical estimates and comparisons are to be conducted. These exposure areas should be determined by exposure scenarios at scales meaningful to specific receptors.</p>	<p>Comment acknowledged. The sampling design described in the Surface Water QAPP will provide information representative of each reach, by locating transects and samples within areas that are typical (i.e., representative) of each reach on the basis of geomorphology and hydrodynamics. Because the area of the site is large, and there is little or no information on the spatial and temporal variability of several key parameters, the surface water sampling program is designed to reduce the current level of uncertainty about the variability at more refined spatial scales, as well as to provide data useful for exposure and risk assessment. The issue raised by the comment (whether there are inappropriate restrictions on the sampling design) cannot be addressed yet without more basic information on temporal and spatial variability of key water quality parameters (e.g., COI concentrations).</p> <p>Text will be added to the first paragraph of Section A7.4.1 to more clearly indicate that the transects will be located in areas considered representative of processes governing water quality within each reach. Text will also be added to Section A7.5 to elaborate on the types of statistical evaluations that will be used to investigate and characterize variability at different spatial scales. The results of these analyses will guide how exposures are calculated within exposure areas for each receptor. Text will also be added to Section A.7.1.1., Conceptual Model and Data Needs/Uses, to broadly outline the process of evaluation of variability and exposure estimation.</p>

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11				<b>Acknowledge limits of current program</b>	<b>Detecting episodic high concentrations.</b> The proposed sampling plan does not incorporate any mechanism to track unusual upsets that could cause pulses of high concentration COIs to be flushed into the river. It seems that an understanding of the frequency and magnitude of such events would be needed in order to quantify ecological and human health risks associated with these events. Addition of a sampling plan for identifying and sampling such events is recommended.	Language will be added to acknowledge that the surface water sampling program is not designed to capture episodic high concentrations of chemicals, unrelated to seasonal or hydrological variations. These are not addressed in the surface water study design and are not embodied in the DQOs developed for the surface water sampling program. As shown in Figure B-22 (a through f) of the draft QAPP, pulses of high concentrations of COIs have not been observed by past sampling efforts. In the unlikely event of an accidental release from the Trail facility, the British Columbia Ministry of Public Safety and Solicitor General has established and tracks such incidences through the Provincial Emergency Program (PEP), and during the course of the RI/FS, Teck has agreed to a rapid response protocol requested by EPA to notify EPA and participating party project managers of any accidental spills or releases.
12	A			<b>Disturbed sampling at all events required</b>	Although recreational use peaks in the summer months, some recreation occurs year-round as does subsistence use. Collect disturbed water samples during all 3 sampling events	The study design will be modified per the request to collected disturbed sediment surface water samples during all three sampling events.
13	A			<b>Modify text to indicate that SW analytes are inclusive of fine-grained beach sediment analytes.</b>  <b>Modify text to indicate that SW analytes may need to be adjusted based on comparison of measured concentrations to pre-established Risk Based Concentrations</b>	Disturbed SW analytes must be inclusive of beach sediment analytes (metals, U, Ra, PCBs, Dioxins, PBDEs) (Woodbury, 2008; Woodbury & Brattin, 2008). Although our current health concerns from surface sediment is generally limited to metals, COPCs suspended in SW will be dominated by very small particles which are not well represented by current data. After initial data analysis, we may refine this list of analytes based on a comparison of measured concentrations to pre-established Risk Based Concentrations.	Section A6.2 Laboratory Analysis will be modified to indicate that disturbed surface water sample stations located proximate to any of the beach sampling locations will include a single sample collected for analysis of those target analytes that are included in the beach sediment study design, but that are not included in the surface water target analyte list. This supplemental analyte list would include Radium 226, Uranium 238, three pesticides (Gamma-BHC; Endosulfan I; Endosulfan II), seven semivolatile organic analytes (1,2-Dichlorobenzene; 1,3-Dichlorobenzene; 1,4-Dichlorobenzene); 4-Methylphenol; Benzoic acid; Diethyl phthalate; Dimethyl phthalate), Aroclor 1262, and Aroclor 1268. Sampling stations (to include a sample for these supplemental analytes) that are proximate to beach sampling locations would include TC1 (North Port Beach), TC2 (China Bend Beach), TC3 (Welty Bay), TC6 (Seven Bays Beach), and TC7 (Swallila Basin beach).  Language within Section A7.1.3 Resources and Deadlines will be added to acknowledge that pending results, and consistent with the RI/FS process, additional analytes may be required as determined by EPA as part of adaptive management.
13b	A	A-10		<b>Modify text to reflect this condition</b>	Comparison of Total Metals Data North and South of the US-Canadian border: -just a note of clarification- the Pend d'Oreille River at the International Boundary site is actually located just downstream of the US border in BC-just downstream of the Boundary Dam in US.  -i.e., it generally represents Pend d'Oreille water as it enters BC from the US. Pend d'Oreille River at Waneta is actually downstream of the International Boundary site and represents Pend d'Oreille water just before it joins to the Columbia River at the border. Note, the Pend d'Oreille River does a little loop into Canada-it is mostly located in the US.	Text will be modified as requested.
14	A	A-12	13	<b>Fix</b>	Lincoln boat ramp is downstream of Spokane River.	The text will be modified as follows: " <i>Lincoln Boat Ramp (downstream of the Spokane River, RM 633).</i> "

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14b	A6.1.2	A-16		See cover letter regarding sampling frequency and timing and use of transects at Waneta. Mixing above the border will be considered through use of transect.	Samples will be collected in a transect across the Columbia at Birchbank - nearsurface and near-bottom samples at 2 offshore locations and 1 sample will be collected at each end of the transect in the shallow nearshore water ~0.5m depth. It would be useful to include justification for the selection of Birchbank BC as the sampling site upstream of Trail, BC. It would be useful to confirm the sampling frequency at Waneta - surface grab samples will be collected before each sampling survey begins (3 surveys - September 09, April and June 10?) - weekly for the period of time that represents the average hydraulic residence time for water entering the site prior to the initiation of the upcoming UCR survey. It appears that the residence time is for water in Lake Roosevelt - in the example given is 50 days. This means that sampling for that would be occurring for 6 weeks. The incomplete mixing and segregation of the waters from the Pend d'Oreille River and the Columbia River should be considered explicitly in the sampling design and data interpretation	The Birchbank station has two important attributes: - it is upstream of the Trail facility and it is one of the monitoring locations routinely occupied by the BC Ministry of the Environment to assess water quality in the Columbia River north of the border with the US. An expanded discussion of the rationale for selecting this station will be added to Section A6.1.2 of the Surface Water QAPP. See response to comment 16 regarding the rationale for sampling frequency and duration at the Waneta sampling station. We propose to add a transect at the border to better assess incomplete mixing between the Columbia River and the Pend Oreille at the northern end of the Site.
14c	A6.1.3	A-17		See cover letter regarding sampling event timing.	Number of Sampling Events. The Columbia River upstream of the border has flow events approximately similar to those indicated; however the late summer low flow is closer to Oct-November.	Comment acknowledged. This issue is addressed via response to comment 1, which proposes a change in timing of the fall sampling event to October.
15	A	A-17		Add discussion as appropriate	The rational for the timing of sampling events as described corresponding to reservoir level. Discussion of any consideration of the effects of the limited thermal stratification also needs to be included.	Consistent with EPA's request, the timing of sampling events will be adjusted to better account for annual flow regimes; specific dates to be included in the Surface Water QAPP are described in response to comment 1. Note that these do not correspond exactly to the time periods suggested by EPA, but do correspond to the hydrographic periods described by EPA, as documented in Figure SW-1. Field temperature measurements will be recorded at each transect and will be considered in data evaluation as appropriate and applicable.
16	A	A-17		Clarify	Individual grab samples at Waneta, B.C. What will be analyzed and what will the samples represent. How will the data be used?	<p>The suite of analytes for the grab samples at Waneta is described on page 2 of Table A-61 of the Surface Water QAPP. They include total and dissolved standard metals (EPA's TAL metals), molybdenum and uranium; conventional parameters, nutrients; and major ions. Detailed lists of analytes for each of these categories is provided in Section B4 of the Surface Water QAPP. Text will be added to Section A6.1 to clarify the list of analytes for the grab samples at Waneta.</p> <p>By repeated sampling over time, an indication of the range of possible water quality conditions that could exist within the system at the time of transect sampling will be obtained. The time series of grab samples to be collected at Waneta are intended to help distinguish potential temporal variation upstream of the Site from spatial variation within the Site during the time period sampled.</p>
17	A	A-18		Modify text	Field analysis. Field measurements are listed as a subset of laboratory analysis. Field measurement need to be considered separately.	The text will be modified to include a new subsection entitled " <u>Field Analysis</u> " to clearly distinguish field measurements from laboratory analyses.
18	A	A-2	26	Fix	MacDonald 1977 should read MacDonald 1997	The text will be corrected.
19	A	A-20		Add information	Conceptual site model and data needs. The conceptual model as stated is unsupported. Similarity of observed concentrations does not by itself establish a causal relationship. Statement of data needs is missing.	This section will be revised to more clearly identify the data requirements of the site conceptual model and how they relate to the problem statement.

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20	A	A-21		Clarify	How will the comparison to regional background concentrations of contaminants be accomplished.	The DQO pertaining to background in Section A7.2 ("Do COIs in surface water significantly exceed regional background concentrations?"), and discussed on page A-31, is a decisional question that will ultimately be addressed by the RI. This question requires both site and background data to be addressed, while the program described by the Surface Water QAPP is designed to address conditions at the site and at two locations upstream of the Site. For purposes of this 2009/2010 surface water QAPP, the DQO referencing comparisons to background on page A-21, and the section pertaining to this DQO on page A-31, will be removed. The issue of whether site water quality exceeds background will be addressed as part of the BERA.
21	A	A-22	8	Clarify what is meant by background	"Regional background data items 1, 2, 3, 4, 5, 6, 7 and 8 will be collected as part of the surface water study." No further mention of how background areas will be identified or even defined is made. The authors should define the background sites and how they will be chosen.	The first three words in this paragraph, "Regional background data" are a typographical error; the text will be corrected to read "Items 1, 2, 3, 4, 5, 6, 7 and 8 will be collected as the surface water study."
22	A	A-23	14	Modify text	Change 'unaffected' to 'least affected' At peak flow and reservoir levels back water conditions extend throughout this reach.	The text will be corrected from "unaffected" to "least affected" as requested.
23	A	A-23	23	Modify text	Misleading statement. The relevant issue is that most data collected had detection limits exceeding SEV values. Therefore, a conclusion on whether or not SEVs were exceeded is not an appropriate evaluation at this time. It is more important to point out the need to conduct comprehensive sampling with detection limits below the SEV values so that conclusions on exceedances have a basis. This point is made on Pg A-15, line 14-15. Reviewer suggests that this bullet be presented first in the summary of existing data.	It appears that this comment is referring to page A-14 and not A-23 as listed, as page A-23 line 23 does not address SEVs. The proposed modification to the text on page A-14 is: "In summary, few exceedances of SEVs were found for surface water at Northport, based on data collected between 2000 and 2006. However, because spatial coverage of the surface water sampling locations is limited to Northport, <i>and many of the chemicals had detection limits exceeding SEVs</i> , all COIs will be analyzed in the proposed sampling program." In addition, the bulleted list will be reorganized to place the statement regarding elevated detection limits first.
24	A	A-31		Clarify	Comparison to regional background levels. What is the regional background surface water quality data that is proposed for comparison? The comparability of these data sets needs to be evaluated before comparisons of individual constituents can be made.	The statement on page A-31 indicating a distribution of regional background data is available for the study area is, at present, premature because such data have not been compiled and/or collected. The DQO pertaining to background in Section A7.2 ("Do COIs in surface water significantly exceed regional background concentrations?"), and discussed on page A-31, is a decisional question that will ultimately be addressed by the RI and that requires both site and background data. The program described by the Surface Water QAPP is designed to address conditions at the site, and at two locations upstream of the Site. For purposes of this 2009/2010 surface water QAPP, the DQO on page A-21 and the section pertaining to this DQO on page A-31 will be removed. The issue of whether site water quality exceeds background will be addressed as part of the BERA.
25	A	A-8		Clarify	Statements about low seasonal and spatial variability are presented for a subset (5 constituents, Table A-2) of the data collected. Why was variability assessed for only 5 constituents when many other were also available in Appendix D? Use all the data or explain why constituents were selected. These data are plotted on a figure (A-4) on which the y axis cover 4 orders of magnitude. For all data considered, plot concentration data on individual plots with scales appropriate to show variability.	<p>The analysis of longitudinal variation in water quality downstream of Northport was conducted by Scofield and Pavlik-Kunkel (2007), and summarized in Section 7.5 of Appendix D of the Surface Water QAPP. The rationale of these authors for using the selected parameters is described in the relevant section of Appendix D, and include</p> <p>"These parameters were selected for the following reasons:</p> <ul style="list-style-type: none"><li>• Their concentrations in water coming into the UCR from Canada were relatively uniform (Table 9).</li><li>• Concentrations measured were similar in magnitude to those measured at Waneta (Table 10)."</li></ul> <p>The source of the data evaluation was inadvertently left off Table A-2 of the Surface Water QAPP, and will be added to that table. In addition, Figure A-4 will be re-plotted</p>

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						as four figures on a linear scale.
26	A	Table A-2A-8	12	Clarify	Table A-2 and its introduction on line 12 of page A-8 should contain more information about how the mean was calculated, as presented it is not clear. Was the mean calculated using all weekly data from 2000-2006?	The table and the text will be revised to clarify the calculations used to generate the mean values presented.
27	A	Table A4		Clarify source of SEVs	Documentation of the SEVs chosen is needed. Full explanation can take place in the SLERA but regardless, additional justification is needed in the QAPP.	Primary literature sources for respective SEVs will be referenced within Section A5.3 <u>Surface Water Screening Relative to Ecological SEVs</u> of the revised QAPP; they have been listed in the response to comment 7, above.
28	A	Table A5		Congeners are required for first round of sampling	Reviewer notes that the surface water QAPP proposes to include analysis of PCB Aroclors via EPA Method 8082A. We are concerned that this current methodology will not provide meaningful detection of low-level concentrations of PCBs in UCR surface water. In consideration of the National Toxics Rule goals, source evaluation, and the recognized presence of PCBs in UCR fish tissue, Reviewer recommends analysis of PCB congeners instead of Aroclors to provide meaningful quantification of PCBs in the UCR system. Reviewer recommends additional discussions with EPA to further define surface water sampling objectives for low-level bioaccumulative organic compounds, such as PCBs.	Section A6.2, <u>Laboratory Analysis</u> , will be modified to include the analysis of PCB congeners. Language within Section A7.1.3 <u>Resources and Deadline</u> will be added to acknowledge that pending data results and consistent with the RI/FS process, refinement of analytes may be required following a sampling event.
29	A	Table A6	Performance Criteria 1	Reference source of conclusion	Concentrations are similar to those in Canadian waters and tributaries. Where is this demonstrated?	The text in Table A-6 addressed by the comment is in the Problem Statement beginning, "Available surface water data are limited spatially and with respect to COIs with metals data being predominant due to the types of sources..." This text will be modified to remove the statement that concentrations are similar to those in Canadian waters.
30	A	Table A6	Performance Criteria 4	Clarify	This performance criterion is not unreasonable as stated, and, if possible, should be pursued. However, there is no assurance 1) that the underlying data to conduct such an evaluation will be generated, and 2) that a non-aqueous exposure risk calculation for many aquatic receptors, say fish or macroinvertebrates, is even possible for many of the COIs. If one is to compare the risk distributions, it would seem important that those distributions are equally well defined. Is this the expectation?	The language describing the performance criterion is confusing, and will be edited. The performance criterion was not intended to include performance of a food web bioaccumulation model. It is proposed that the performance criterion in question be clarified to read: "Do COI concentrations in surface water pose an unacceptable risk to aquatic life or wildlife in the absence of bioaccumulated chemicals in their foods?" In the bullet below this performance criterion, the term "food web model" will be replaced by "wildlife exposure model"
31	A4.1	A-2	Introduction 3 <sup>rd</sup> Paragraph	Modify text in QAPP to match work plan	The text also should acknowledge historical PCB usage and storage at the Trail smelter facility. PCBs from the Trail smelter facility reportedly have been stored at a hazardous waste handling facility established in the Stoney Creek drainage. This demonstrates that PCBs were used at the Trail facility. The potential for release of PCBs to the Columbia River from the Trail facility should also be acknowledged.	The text will be modified to include the following proposed text at the end of the 3 <sup>rd</sup> paragraph – "In addition to the above-mentioned elements and chemicals, the Trail facility historically used and temporarily stored polychlorinated biphenyls (PCBs)."
32	A4.1	A-3	4-7	Modify text	Please modify the text to indicate the current status of the SLERA, and specify that an early, unapproved version was used to identify apparent surface water data gaps. In addition, the text mentions that longitudinal and temporal coverage of water samples were found to be insufficient. Please clarify that a similar level of data insufficiency applies to lateral, vertical and event-specific coverage of UCR surface water quality.	The text addressed by the comment is introductory material and will be footnoted to indicate the status of the SLERA at the time the final QAPP is published. The reference to COIs does not refer to those identified by the SLERA, but to those identified in the RI/FS Work Plan, as listed in Tables 1 and 3 of Appendix D. These tables will be included among tables in the main text of the Surface Water QAPP, and the source of the COI lists will be clearly identified as the RI/FS Work Plan. Discussions of the limitations of available data are provided in the first paragraph of Section A5.4, and in Appendix D.



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33	A5	A-6	31	Clarify data set and data treatment; either include available mercury data or explain why it is not appropriate to present in the QAPP	Please specify what is meant by "available surface water data". For example, mercury data were notably absent from the assessment of surface water in Section 5 of the RI/FS Work Plan, and conspicuously absent from Waneta station mean concentration plots in the surface water QAPP (i.e., missing from the Figure B-22 series). Please provide a full, detailed explanation for the absence of mercury data and any other critical water quality parameter. In addition, describe what standard methods were applied to constrain the use and presentation of surface water quality data in the SAP. In particular, what criteria were used to temporally constrain the data sets?	No data were found for several COIs, requiring the qualifying language “ <i>available surface water data</i> ”. Among the historical information for Waneta, there are no data describing mercury concentrations.  Data sets used in the evaluation summarized in the section addressed by the comment, their evaluation, and considerations for use, are described in Appendix D to the Surface Water QAPP. If the reviewer is aware of COI data that is not summarized within the RI/FS work plan or SURFACE WATER QAPP, we would appreciate information regarding what that data is and how it might be obtained. Any such data of good quality would be incorporated into the project data base and evaluated accordingly.
34	A5.2	A-11	31-37	Indicate that what may impact SW quality is not meant to be exclusive of other factors	The subsection titled Field Measurement and Stratification in the UCR discusses conductivity as a measure of major ion content in water, and ascribes the associated cations and anions in surface water to be a reflection of rainfall, runoff and groundwater infiltration. Please modify the text to indicate that surface water conductivity also can be influenced by pore water flux (especially during a falling reservoir period), tributary inflow, and point source discharges. Note also that stratification can occur at both a micro and macro scale in a large reservoir system such as Lake Roosevelt. Figure A-5 presents a macro-scale representation of reservoir stratification for selected thalweg-positioned monitoring stations. Micro-scale stratification and/or conductivity gradients can be expected near the surface water/sediment interface, especially in areas where pore water conductivities are elevated in comparison to main channel conductivity values. Please modify the text to note that the proposed sampling approach specified in the QAPP may help identify whether stratification and/or conductivity gradients are evident in the general vicinity of the surface water/sediment interface during various reservoir drawdown and discharge conditions.	Text will be modified to indicate that surface water conductivity can also be influenced by pore water, tributary inflow, and point source runoff. Text will additionally be modified to provide examples of factors that can influence stratification, and text will be modified to indicate that the surface water sampling programs is not designed to address potential micro-scale stratifications whether they are due to thermal and/or conductivity gradients.
35	A5.2	A-12	24-28	Modify to address uncertainty	While temperature and conductivity stratification may not be readily evident in the main thalweg through Marcus Flats, it may be seasonally evident in the side flat and embayment areas (e.g., south of Pingston Creek) where flow likely is more stagnant, and depths are shallower. Please modify the discussion to address this uncertainty.	Text will be modified to indicate that the surface water sampling program is not designed to address potential micro-scale stratifications whether they are due to thermal and/or conductivity gradients.
36	A5.2	A-7	32-33	Remove Pend Oreille text	If Teck’s analysis is intended to demonstrate commonality between Columbia River and Pend Oreille River water quality, then the SAP should include specific surface water samples from the Pend Oreille River to further confirm this hypothesis, and help quantify metal loads associated with this tributary.	Demonstration of commonality between the Pend Oreille and Columbia rivers is not a DQO of the Surface Water QAPP. The discussion in the referenced section addresses an overview of historical data , including a comparison of total metals data in the Columbia and Pend Oreille rivers in Canada to total metals data in the UCR at Northport. Therefore, no modifications are required, and we propose to retain this text to better represent the available information.
37	A5.2	A-7	32-33	Add detail where possible, if not possible indicate why	<p>In addition, this Section A5.2 overview of existing surface water data also should address:</p> <p>Organic compounds in surface water.</p> <p>The importance of total suspended solids and the propensity for particulate-bound metal transport.</p> <p>Expected vertical variability in contaminant concentrations within the water column.</p> <p>Degree of mixing at various sampling stations (e.g., Northport), and how incomplete mixing may affect the understanding of water quality conditions at various proposed or existing water quality monitoring stations on the UCR.</p>	<p>Available information on organic chemicals in water is described in Appendix D to the Surface Water QAPP. Text will be added to Section A5.2 to discuss the existing data for organic compounds in surface water, which is largely absent or undetected.</p> <p>Generally, however, processes and water quality parameters governing the distribution of metals in the water column and resulting patterns, such as the transport of suspended solids, the vertical distribution of chemicals, and the degree of mixing, cannot be addressed with existing data, and will therefore not be included.</p>

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38	A6.1.1	A-13	15-19	Disturbed sampling at all events required, need to see SOP for sampling (SW-16)	The specific methods used to simulate "sediment disturbance" are not clearly identified. How is "disturbance" performed to ensure its uniformity from site to site? Will TSS be measured to help gauge the localized changes in water quality immediately around the area of sediment disturbance?	As discussed in response to comment 12, disturbed sediment surface water samples will occur at all three proposed surface water sampling events. TSS is one of the parameters measured in all samples, although it is measured as part of the laboratory analysis of the sample, not during sampling. The disturbance process is designed to simulate human recreational activities and does not establish a "threshold" of disturbance at which point the sample is collected. SOP-SW 16, Collection of Disturbed Near-Surface, Nearshore Surface Water Sample, which was accidentally left out of the FSP attachments submitted with this QAPP, will be attached to the revised version and explicitly describes how the disturbance of sediment for the purpose of collection of these surface water samples is performed.
39	A6.1.2	A-16	Last Paragraph	Explain reasoning for sampling several weeks in advance	While sampling at the Waneta station is favorably endorsed by Reviewer, the current rationale for sampling at this station several weeks in advance of any sampling that will occur at stations south of the border is not well supported. Specifically, the discussion of using hydraulic residence times to guide the sampling schedule is confusing, appears baseless, and is inconsistent with the rest of the surface water sampling program. Additional presentation of the hydraulic methods of analysis that Teck will use to estimate "average hydraulic residence times" per sampling event must be presented. The basis and justification for sampling at Waneta, and then waiting for the entire slug of river water to pass through the UCR system before subsequent sampling occurs at the U.S. sampling stations is not evident. If consideration of hydraulic residence times has merit, Teck should provide a discussion of anticipated residence times from Birchbank to Trail, Trail to Waneta, and from the border to each proposed sampling transect under the full range of expected flow conditions. This same comment applies to the discussion under Section A6.1.3 on page A-17, under Section B1.1.2 on page B-3, and on Table A-6.	<p>The time series of grab samples to be collected at Waneta are intended to help distinguish potential temporal variation upstream of the Site from spatial variation within the Site during the time period sampled.</p> <p>It is proposed that additional text be added to Section A7.6.4, <u>Evaluating Similarity Across Transects</u>, and to Table A-6, to further describe the applicability of the time series data and support the approach outlined in Section A6.1.3 and Section B1.1.2.</p>
40	A6.1.3	A-17		Modify sample event timing as indicated in letter	Please ensure the dates for the sampling events are revised to coincide with the currently anticipated schedule. Note also that the current sampling schedule is designed, primarily, to capture anticipated changes in reservoir stage; the current sampling schedule is not necessarily timed to best capture major seasonal or daily changes in river flow and stage - particularly in the uppermost riverine sampling stations. Please modify the introductory paragraph of Section A6.1.3 to note that "key time periods" primarily relate to recognized seasonal variations in reservoir stage. These periods may not coincide with flow or stage conditions which may have the greatest impact on surface water quality conditions in riverine portions of the UCR. Confirm that the current number of field sampling events sufficiently captures expected seasonal variability in flow, stage and water quality in the riverine portion of the site - not just reservoir conditions.	Consistent with response to comment 1, all dates within the revised surface water QAPP will be modified to accommodate the following sampling schedule: sampling event #1 (October 2009), sampling event #2 (March/April 2010), and sampling event #3 (May/June 2010).
41	A6.1.3	A-17		Update	Number of sampling events. This section will obviously need to be updated to reflect the sampling time frame presented in the RI/FS Work Plan (once approved).	Comment acknowledged. Teck will continue to work with EPA in periodically reviewing and updating the project schedule as the RI/FS progresses.

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42	A6.1.3	A-17		<b>Disturbed sampling at all events required, need to include SOP for sampling (SW-16) in QAPP</b>	The justification for collecting only a single nearshore surface water sample during an early September sampling event when human use is assumed to be more "prevalent" is not supported by any cultural or recreational use data. The rationale for near shore surface water sampling goes beyond merely supporting the human health risk assessment, but also includes ecological risk assessment and overall characterization of the nature and extent of contamination. Nearshore surface water samples should be collected during all sampling events.	As discussed in response to comments 12 and 38, disturbed sediment surface water samples will be collected at all three proposed sampling events, and text will be modified to reflect this change.
43	A6.2	A-18	21-22	<b>Add</b>	TCAI 2007b is not included in the Section E list of references-please add.	This reference is no longer applicable; the reference will be removed and the text will be modified to refer the reader to Figures B-1 through B-6.
44	A6.2	A-18	12	<b>Clarify</b>	Please clarify if "total" metal analysis indicates "total recoverable" metals.	Metals data will be provided on a total recoverable basis; the text will be modified to clarify this.
45	A7.1	A-19	Step 1	<b>Remove subject text</b>	It is inaccurate to state that "most of the chemistry data for the UCR is for sediments." A robust, albeit incomplete (e.g., absence of mercury data) surface water quality data set has been generated for the Waneta station. Surface water quality data collected at the Waneta station can be obtained from the Environment Canada water quality web site: <a href="http://waterquality.ec.gc.ca/WaterQualitWeb/data.aspx?stationId=BCO8NEOOO">http://waterquality.ec.gc.ca/WaterQualitWeb/data.aspx?stationId=BCO8NEOOO</a> , and provided by Teck. Numerous other types of "chemistry data", representing a variety of environmental media, are available for the UCR. Please modify the text accordingly and include relevant Canadian-generated surface water data.	<p>The reviewer is correct that a robust surface water data set exists for the Waneta sampling station; this data set is summarized in Appendix D of the draft Surface Water QAPP. However, this data was collected outside of the Site and therefore is not discussed in this portion of the document.</p> <p>The entire sentence beginning with the statement that "Most of the existing chemistry data for the UCR is for sediments;..." will be deleted. The final text will read as follows: "The UCR RI/FS was initiated by concerns regarding emissions from the Trail facility including but not limited to discharges of liquid effluent and granulated slag into the Columbia River. Additional surface water data are needed to assess water quality conditions in representative reaches of the UCR. The 2009/2010 surface water study..."</p>
46	A7.1.1	A-20	18-20	<b>Point out that knowledge on organics is extremely limited and conclusions are preliminary. Indicate that special sampling may be required to measure low-levels of organics in surface water</b>	Until sufficient data are generated, it is premature to assume an absence of significant organic sources. Bioaccumulative organics such as PCBs, for example, are commonly detected in UCR fish tissues, demonstrating their presence in the UCR system. Other organic compounds listed in Appendix D also have been detected, albeit relatively infrequently. An apparent absence of organic compounds (based on a recognizably limited data set) does not serve as the justification to focus primarily on metals and characterize general water quality conditions at this point in the RI. See other comments regarding the role of the DQO process for determining data quality and analytical requirements for the surface water sampling program. For organic constituents (such as PCBs) which may be present at low-level concentrations in UCR surface water and require low-level detection methods (see other comments related to this), semi-permeable membrane devices are a potential option to support detection of these or other organic COIs.	Comment acknowledged. The text will be revised to emphasize that the data set for organics within surface water of the UCR is limited. Language within Section A7.1.3 Resources and Deadline will be added to acknowledge that pending data results and consistent with the RI/FS process, refinement of analytes may be required following a sampling event.
47	A7.4.1	A-22	30-31	<b>Modify text in QAPP to match work plan</b>	The latest version of the RI/FS Work Plan, at the time of this Surface Water QAPP review, was still undergoing revisions by EPA. It is not certain if the referenced "units" are still contained within the revised version of the Work Plan. Please verify, and if necessary, modify in accordance with the most current version of the RI/FS Work Plan.	The text will be modified to make clear that the descriptions of the physiographic units listed within the revised surface water QAPP are consistent with those in the RI/FS work plan.

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48	A7.4.1	A-23	26-31	Expand on what is meant by “transitional”	Both Reach 3 and Reach 4 are described as "transitional". Please specify what is meant by the term "transitional". While Reach 3 may be viewed as transitional, during certain flow regimes and reservoir levels, from riverine to lacustrine, it is not clear what transitional connotation is being applied to Reach 4.	The term "transitional" derives from the river reach descriptions in the RI/FS work plan. Language will be reviewed to ensure consistency, and text will be modified to further clarify what is meant by the use of the term "transitional" in describing reaches 3 and 4.
49	A7.4.1	A-23	4-7	Remove lines 4 - 7	Reviewer disagrees with the statement that Phase I RI sediment data collected by EPA in 2005 demonstrate relative within-reach homogeneity of COI concentrations. Concentrations of many COIs vary both longitudinally and transversely within the various reaches. For example, slag-related COI concentrations in the uppermost reaches show broad variability depending on sample location. Similarly, COI concentrations demonstrate considerable transverse variability in many lower and middle lower reaches of the UCR. It is unclear how this discussion of sediment COI variability is used to justify assumptions regarding COI variability in surface water. These statements also directly contradict the discussion on Page B-2 (2nd bullet - Variability in sediment-bound COIs) where it specifically states that "the existing sediment data set contains substantial variability in the concentrations and relative distributions of metals." Please revise the text accordingly.	The paragraph in question will be deleted from the text.
50	A7.4.1	A-23	1-3	Edit passage to identify that variability is unknown. An edit such as “apparent nominal variability” would also be acceptable	The data from Figure A-4 are limited, at best, and of somewhat uncertain representativeness in terms of depicting conditions "throughout most of the site". Given the absence of information regarding sampling depths, specific channel location, and uncertainties over data QA/QC, it is premature to assume or suggest that a level of "nominal variability" exists for either non-COI or COI parameters. Please revise the text accordingly.	Please see the response to comment 25. The analysis concluding that longitudinal variability in water quality was low in the UCR, and which is partly supported by the data depicted in Figure A-4, was conducted by Scofield and Pavlik-Kunkel (2007). The data will be plotted on individual figures, and on a linear scale, in the revised QAPP. The word “nominal” will be preceded by “apparent” in the subject text in Section 7.4.1.
51	A7.4.1	A-23	8	Fix the inconsistency with the sampling locations	With the inclusion of station TC8, there appear to be eight proposed sampling locations, not seven.	The text will be modified to accurately indicate the number proposed sampling locations within the Site. With the requested additional transect, the actual number of transect locations will be nine.
52	A7.4.1 & B1.1			State the need to include information about how conceptual hydrodynamic model will inform and be informed by the sampling	The description and the assumptions made regarding river conditions described here do not seem unreasonable. They are just unsupported. These sections employ verbs like “assume” and “tend”. While the hypothesis that Marcus flats is the dominant depositional area seems true, how do we know this? Where and how many other depositional zones are there? How big are they? Are these assumptions, anecdotes and visual observations enough to design an adequate sampling plan? How did you validate these assumptions? The hydrodynamic modeling outlined in the original work plan would be very useful to include in the QAPP. Further, will the constituents proposed here be informative to the model? Some discussion of how this sampling supports the development and calibration of the model would be helpful.	The surface water sampling plan is designed to address data gaps regarding exposures and risks to ecological receptors and people resulting from the surface water pathways defined in the CSMs. The design is not intended to address hydrodynamic, and associated sediment transport, models. However, the SW sampling transects are located in river reaches that reflect the varying hydrodynamic conditions in the UCR, consistent with the conceptual hydrodynamic model. The discussion regarding river reaches is based on text developed for the RI/FS work plan. Text will be reviewed and modified to be consistent with the presentation in the RI/FS work plan. Sediment sampling will provide more information about the hydrodynamic model and its relationship to sediment quality and transport of particle-bound COIs.
53	A7.4.2	A-24	21	Consider figure mod	In addition to showing seasonal pool elevations (Figure A-6) the QAPP should include a figure displaying diurnal flow and stage fluctuations as measured in Reach 1. These variations may have a measurable impact on surface water quality in the riverine portions of the UCR, and should be shown on a figure. The attached Figures I a and I b show diurnal changes in flow and stage as measured at the USGS gauging station 12399500 – Columbia River at International Boundary during summer/fall2008.	Further to Comment 1, a revised figure illustrating seasonal pool elevations in conjunction with seasonal flow variations has been generated (see Figure SW-1) and timing of sampling events have been modified to better account for annual hydrologic flow conditions into the UCR and associated water quality. Diurnal processes are not targeted by the study design and are not addressed by the DQOs at this time

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54	B	Figures B22a – B22f		Provide additional discussion	Examination of historical water quality data from the Waneta station for the period of 1995 through 2007 shows that for several parameters (e.g., antimony, boron, cadmium, copper, lead, and zinc) the currently proposed sampling schedule would not capture the anticipated seasonal maximum concentrations for these COIs. Reviewer also notes the apparent absence of all mercury data for this same period. Please provide additional discussion of the possible implications of sampling events that may not capture an anticipated maximum concentration condition. Please explain why mercury data are not presented and evaluated along with the other metal COIs.	Consistent with response to comment 1, all dates within the revised surface water QAPP will be modified to accommodate the following sampling schedule: sampling event #1 (October 2009), sampling event #2 (March/April 2010), and sampling event #3 (May/June 2010). These shifts in proposed sampling dates will increase the extent to which proposed sampling complements many of the seasonal maximum concentrations identified by the reviewer. As discussed in response to comment 33, we do not have and are unaware of any data for mercury for the Waneta station; if the reviewer is aware of data that we may be missing, we would appreciate this information and would be happy to evaluate this data as part of the RI.
55	B	Table B2	Comment E	Clarify	Which reporting level is it? It is unclear which analytical reporting level will be attained. Are different samples getting different reporting levels? Please clarify.	As described in Section 4.1, the Method Reporting Limit is used as the reporting level, with values below the MRL but above the MDL reported, but qualified as estimated. In general, reporting limits should be the same for a given analyte among samples because there are no corrections to be made for surface water media (e.g., correction for dry weight). To further clarify this issue, a footnote can be added to Table B2 to indicate the use of the MRL as described above.
56	B1.1.1	B-1	4 <sup>th</sup> Bullet	Edit to state that Teck’s writing is not an exclusive argument	Note that COIs also may enter the UCR water column via pore water flux/groundwater discharge and/or via bank storage releases.	It is proposed that the text be modified to read as follows: COIs may enter the UCR water column via from two primary pathways—sediment resuspension and tributaries—both of which were considered when selecting transect locations. Additional pathways of COI entry, including pore water flux/groundwater discharge and releases of bank storage, are also possible sources of COIs to the UCR.
57	B4	B-10	24	Clarify	Please clarify whether total standard metals and metalloids is synonymous with the term common metals and metalloids used in Table A-5	The text will be modified to remove the term "standard" so that it is inclusive of all metals and metalloids listed in table A-5.
58	FSP	2-6	9	Add information as appropriate	How will quality assurance applied to the depth sensing instrumentation and what quality control measures will be applied.	Comment acknowledged and text will be corrected. Depth sensing instrumentation comes calibrated from rental facilities. As a control measure, readings from a hand held depth sounder or multiprobe sensor will be compared side by side with a graduated lead line at the beginning of each sampling day and a conversion factor applied to the readings if necessary.
59	FSP	1-1	21	Add information as appropriate	Should review current and historic maps of landslide activities maintained by USBR	Information on landslide activity in the area will be checked, and the statements at the end of the last paragraph on this page will be updated as appropriate.
59b	FSP 1.1	1-4	22-24	Include water depth measurements	Field measurements    Measurement of water depth at each site should be included	Text will be modified to include measurement of water depth among the field measurements taken. See Water Sample Log form in Attachment A3 under Appendix A of the FSP.
60	FSP	1-5	3	Modify text	Separate field forms should be kept for each site to record multiple instrument readings over the sampling time period to document instrument stability.	Text will be modified to explain that a field form will be kept for each site to record multiple instrument readings over the sampling time period to document instrument stability; text will reference water Sample Log form in Attachment A3 under Appendix A of the FSP.

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60b	FSP 2.2.3	2-3		Include details of measures to prevent cross-contamination in FSP or SOPs	<p>Sampling Vessel, Field Equipment, and Supplies</p> <p>Low level variables will be analyzed. The proposal is to collect samples with a boat and prepare samples onboard on the deck. It appears that samples will be prepared and subsampled on an open deck. The laboratory power needs will be met by a portable 3000-watt generator. How will the samplers protect from sample contamination from the generators fumes? We usually make sure generators are a large distance away from sample processing. The fumes will certainly contaminate the organics being analyzed, as well as some metals. Further, in a riverine site-Birchbank in Canada and at Northport the vessel will need to maintain power to keep in position in the flowing river, thus the vessel will need to be powered up. It would be very difficult to anchor the vessel with the current in the river. What measures are planned to prevent the engine fumes from contaminating the samples being processed on the deck of the vessel? Even sampling with a peristaltic pump into bottles can result in contamination from fumes for any waters exposed to the atmosphere. It is suggested that distilled/deionized water blank samples be employed at sites to assess potential contamination from fumes or other atmospheric sources. A suggested protocol is to open the lid on the bottle for the same amount of time as it takes to manipulate the real samples and then re-lid the bottle. It looks like bottles will be used for sampling the offshore sites. Care needs to be taken in collecting the near bottom sample to prevent disturbing the sediments and potentially adding bed sediments to the sample-thus one can introduce pore waters and associated sediments to the sample. If one introduces sediments or pore water to the sample, the metals levels will likely go up, but won't represent the natural, undisturbed water quality near the bottom. In the riverine sites were there will be a substantial current, bottom sampling will require a weight. Care should be taken to avoid contamination from the weights and from resuspended sediments.</p>	Comment acknowledged. SOP-SW7 describes procedures for implementation of the “clean-hands technique” for water sampling. The approach described in the FSP and this SOP has been used successfully for other ultra-trace level field work. The text of the Section 2.2.5 of the FSP will be reviewed and modified as appropriate to address the specific scenarios noted by the comment. In addition, this section of the FSP will be refined as needed to point out specific procedures for prevention of cross-contamination, and to avoid sediment disturbance while sampling in the river.
61	FSP	2-12		Clarify	Field splits samples. Will these samples be collected sequentially or simultaneously?	The text will be modified to clarify that field split samples will be collected sequentially from the peristaltic pump or successive Go-Flo grabs. For PUF cartridges, split samples will be collected sequentially as surface water is pumped directly from the river through the PUF cartridges.
62	FSP	2-10	31	Add information as appropriate	Continuous profile of in-situ field measurements needs to incorporate procedures to ensure that the different sensing probe reach stability at each stage in the profile (particularly ORP).	Comment acknowledged and text will be revised to clarify that different multiprobes have different stability reading requirements, and that therefore, to ensure that the different sensing probes reach stability at each stage in the profile (particularly ORP), the user must refer to the specific user manual for the multiprobe used at the site. Each probe has a different response time (e.g., ORP <15sec.; optical dissolved oxygen 30 sec). The rate of ascent and descent will need to be calculated according to depth at the site and specific probe response time.
63	FSP	2-10	33	Add information as appropriate	What is the DQO for ORP?	As discussed in the Data Quality Objectives (Table A-6), field measurements of water quality parameters, including ORP, at all stations is relevant to the interpretation of all surface water data. No change to text is proposed.
64	FSP	2-3	31	Clarify	How will samples be collected and at what depth?	The text will be revised to clarify that sampling at stations near the shoreline will occur at a depth of 0.5 meter and the sample will be collected halfway between the bottom and the water surface (at a depth of 0.25 meters below water surface).

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65	FSP	2-4	1	Address as appropriate (This should also be covered by the general SOP comment)	<p>These samples will not be collected isokinetically and will thus under represent constituents that are associated with suspended sediment.</p> <p><a href="http://water.usgs.gov/owq/FieldManual/Chapter2-Archive/Archive/2.1.html">http://water.usgs.gov/owq/FieldManual/Chapter2-Archive/Archive/2.1.html</a> may be helpful.</p>	Comment acknowledged. The revised sampling approach (see response to comment 69b) may partially alleviate this concern.
66	FSP	2-4	12	Modify text	<p>The information contained in the SOP-SW6 for the in-situ measurements made with YSI instrumentation is incomplete.</p> <p>As stated in the SOP, USGS protocols are referenced throughout. However, it is not outlined how they will be followed. A standard SOP outlines exactly how measurements will be conducted. Also there is no mention of quality assurance protocols in place to assure good field procedures.</p> <p>Procedures need to be included for measuring field constituents such as temperature, pH, DO, and ORP that are inherently unstable. When measuring these constituents with an electronic instrument, criteria for instrument stability needs to be established before a final reading is obtained for the sample. Instrument stability varies with both constituent and individual measurement instruments. Established criteria and procedures for ensuring instrument stability need to be clearly defined in the SOP. There needs to be an established criteria of stability (for example DO must be within +/-0.2 mg/L, see table 6.0-1 of NFM chapter A.6 for stabilization criteria for recording field measurements).</p> <p>There is no mention as to how field measurements will be measured in the field. Measurements in still waters such as a lake differ than that of flowing water. Often, multiple points of in-situ measurements are needed to determine a representative set of field measurement values. In-situ measurement is mandatory for determination of temperature, dissolved-oxygen concentration and Eh (subsamples are not adequate). Measurements made at a discrete depth through the vertical water column must be averaged or reported as a median value that represents the entire vertical. Also, how the field measurement is taken must be clearly defined. Such as, "upon reaching the desired depth/location the meter/instrument is allowed to equilibrate for 60 seconds after which field readings will be taken until stabilized (to within an established criteria). The median of three or more of values measured after the readings stabilized will be reported."</p> <p>Quality control checks during field measurements need to be part of the SOP to ensure precise and accurate field values. For example it is one thing to state that meters will be calibrated according to manufactures specifications, but how is one to know that the calibrated meter is actually calibrated. A back-up meter should be brought into the field for comparison and reference samples should be brought for spot checking such as a zero DO solution. For example, in areas of low dissolved oxygen (oxygen &lt;1.0mg/L), another method should be utilized such as spectrophotometric methods describe by Chemeterics, Inc, This is recommended for accurate determination of DO concentrations in suboxic water over a concentration range of less than 0.1 µg/L to approximately 1.0 mg/L.</p> <p>Eh/ORP- There is no reference on how probe will be calibrated. Zobell solutions are not mentioned. Also, what are the criteria for determination of instrument stability prior to reading value for this constituent?</p>	Comment acknowledged. Text will be modified to clarify that the details on field procedures for quality control on measurements of surface water quality parameters are addressed in the relevant instrumentation manuals. If requested by EPA, instrument manuals can be included in the attachments to the FSP.
67	FSP	2-5	12	Modify text	<p>Go-Flo bottles need to be positioned parallel to flow so that river flow can easily move through the sampling bottle. The intake nozzle of pumping samplers needs to be oriented upstream, or into the oncoming flow.</p>	A site-specific GO-FLO SOP will be developed and added to Attachment A2 to the FSP that will address this comment. Details on tubing intake used with peristaltic pumps can be found in SOP-SW4

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68	FSP	2-6		Clarify	Field cleaning—Cleaning procedures outlined in SOP-SW15 indicated that equipment cleaned in the laboratory would include acid and solvent rinse steps. Pg. 2-13 indicates that no solvent or acid waste would be generated in the field. Does field cleaning and decontamination involve acid or solvent rinse steps or does it differ from laboratory process. If different, will equipment rinsate blanks (Pg 2-12) be collected after field decon?	No field waste will be derived from the use of the peristaltic pump sampling method. However, there will be field waste derived from decontamination of GO-FLO bottles between stations and a field blank will be collected from the GO-FLO after decontamination. Text will be corrected to clarify the decontamination procedure and frequency. See also response to comment 69b.
69	FSP	2-6	7	Drop the parenthetical basis in text. Clarify the operational logic and criteria for selecting an alternative location. Need criteria for abandoning allocation and the selection criteria for replacing it with another	“(sampling above steep slopes will be avoided as recent sediment deposition on steep slopes is considered less likely than along areas that are flat).” Why are we concerned with only recent deposition—it is quite possible that old deposition is just as much a risk as newer deposition? There is no justification or proof given that a difference in depositional rates exists between steep and flat areas. What is the definition of steep and flat?	The text will be revised as requested. Locations will not be abandoned.
69b	FSP	2-8		Consider using suggested method or include details of measures to prevent cross contamination of composited samples in FSP or SOPs	<p>Sample Compositing and Analyses</p> <p>Compositing the sample water into one large 10L container and then subsampling for the various analyses will have several potential problems associated with it. Although it appears as a good approach- i.e., you make sure all samples are from the same mixed source, it is fraught with potential contamination problems. It is also far more complicated than it needs to be-the more complicated the sampling, the more opportunities there are for problems. You need the keep the compositing vessel clean; it will be difficult to manage because of size; it will give greater period of time for contamination from the generator and boat motor fumes and it involves considerable "handling" of the water which inherently introduces opportunities for contamination. A simpler approach would be to sample directly into the sample bottles and immediately cap the bottles. This is particularly easy to do when using a peristaltic pump. It is acknowledged that there can be some micro-variability in water, but at least that is part of the water and not something introduced by human handling and re-handling of the water. If samples are collected individually, it will also be easier to collect field replicate data, which will give the information needed on variability at the site. I believe if the planned approach is used, you may get some very interesting data and some very unexplainable data.</p> <p>When appropriate, sample bottles should be filled to zero head space to minimize air contact with the sample. Provision should be made to prevent the contamination by the filtration step and to confirm the absence of contamination with filtered field banks.</p>	Teck agrees that there is the potential for contamination in the proposed sampling methodology if rigorous attention is not paid to clean handling techniques. The sampling and compositing methods described in the SURFACE WATER QAPP were intended to ensure that all analytical samples were drawn from a single composite. This sampling and compositing method has been successfully applied to other sites. However, Teck also agrees that the modifications to the sampling methodology described by the reviewer would further reduce the potential for inadvertent contamination, and will modify methods to use the sampling methodology described by the commenter.
70	FSP	2-9		Clarify	Will the DOC and TOC samples be pulled from the polycarbonate or glass composite mixing container?	Page 2-9, line 37-38, of the FSP currently states that the polycarbonate container will be used for compositing samples for conventional parameters. However, since the sampling method will be modified according to comment 69b, samples for TOC and DOC will be collected directly into the sample bottle.



Comment No.	Section	Page	Line	Requested Change	Comment	Response to Comment - Proposed Revision
71	FSP	2A-11	13	Clarify	“...Blind field replicate samples will be collected and analyzed to assess the environmental, sample processing, and laboratory variability within a sampling location.” Does not describe how close to the original sample the replicate will be taken. More description is needed of the spatial layout of samples relative to one another.	Text will be revised to clarify that replicates will be taken at the same location and depth where original samples are taken.
72	FSP	A2-11	28	Explain rational for triplicates (i.e., EPA’s suggestion that they would provide suitable indicators of variability above and below Teck operations)	“Field triplicates will collected at all sampling locations along Transect TC3 (Marcus Flats) and Transect CAN1 (Birchbank, B.C.) in September 2008 to assess cross-channel variability.” Why collect them all in TC3 and CAN1 and describe the method in more detail—how close are the triplicate samples to each other?	<p>Field triplicates will be collected at two transects. The triplicates will be used to document the short term variability within a transect . Triplicates will be taken at two locations: at CAN1 to document variability above the Trail facility, and at TC3 to document variability at a location that is both below the Trail facility and at which slag deposits are known to exist (the purpose of sampling triplicates at CAN1 and TC3, and the uses of the data are explained in greater detail in Section 7.6 of the QAPP). Text in the FSP will be modified to more accurately reflect the rationale.</p> <p>At each sample location within a transect, triplicate samples will be collected sequentially, all from the same location.</p> <p>The necessity for field triplicates in subsequent sampling events will be determined on the basis of the variability observed in the first data set. Text in the FSP will be added to clarify the conditions under which the second and third sampling event will include field triplicates at these transects.</p>
73	FSP	Table 2-1		Clarify	Is 48 hr hold time for anions Cl, F, and SO4 correct?	No, the correct holding time for these anions is 28 days. The tables in the QAPP and FSP will be corrected to reflect this change.
74	FSP	Table 2-2		Fix	Unit for water depth is given in meters. Transect 7 planned depth of near bottom sample is 340 meter, which exceeds maximum depth of reservoir.	The correct units for water depth are meters. Although the units shown in the table are meters, the values were mistakenly provided in feet. The depth values in the table will be corrected to meters.

Notes:  
BERA = baseline ecological risk assessment  
CCC = criterion continuous concentration  
CCME = Canadian Council of Ministers of the Environment  
COI = chemical of interest  
CSM = conceptual site model  
DOC = dissolved organic carbon  
DQO = data quality objective  
FSP = field sampling plan  
HHRA = human health risk assessment  
MDL = method detection limit  
MRL = method reporting limit  
ORP = oxidation-reduction potential  
PCB = polychlorinated biphenyl  
PEP = Provincial Emergency Program  
PUF = polyurethane foam  
QAPP = quality assurance project plan  
RI/FS = remedial investigation/feasibility study  
SEV = screening ecological value  
SLERA = screening-level ecological risk assessment  
STI = Spokane Tribe of Indians  
TAL = target analyte list  
TOC = total organic carbon  
TSS = total suspended solids  
UCR = Upper Columbia River  
USEPA = U.S. Environmental Protection Agency  
USGS = U.S. Geological Survey

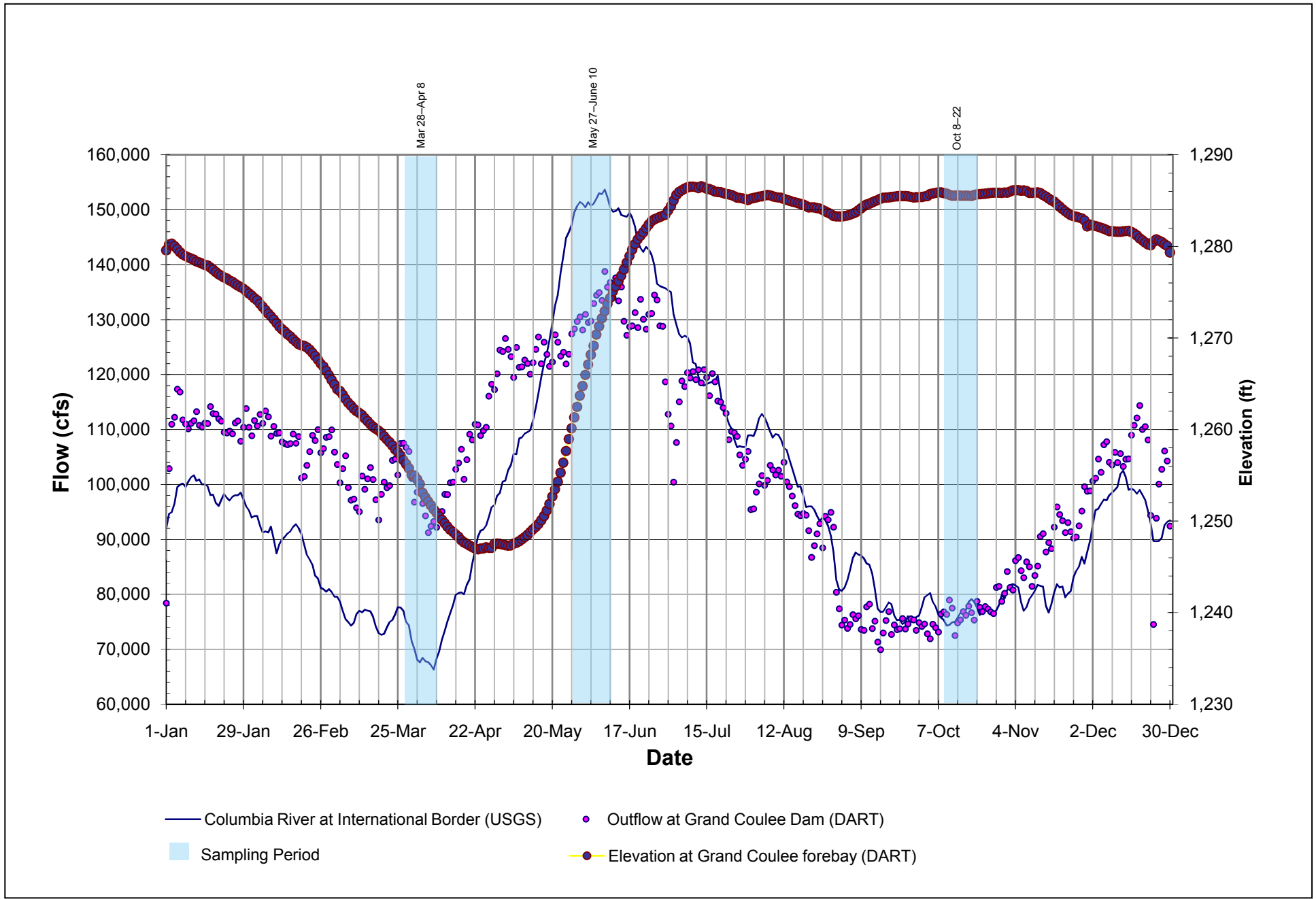


Figure SW-1. Plot of Average Input Output Flow Rates Relative to Reservoir Water Elevations within Lake Roosevelt as a Function of Time Since Upstream Dam Construction (30-Year Averages)

Table 1A. Summary of dissolved metal concentrations at Northport since 1999.

Analyte	Season	Number of Samples	Mean Concentration (µg/L)	Standard Deviation
Arsenic	Fall	14	0.39	0.069
Arsenic	Spring	15	0.48	0.077
Cadmium	Fall	14	0.034	0.061
Cadmium	Spring	15	0.025	0.014
Copper	Fall	14	0.49	0.063
Copper	Spring	15	0.59	0.23
Lead	Fall	14	0.020	0.012
Lead	Spring	15	0.037	0.028
Nickel	Fall	14	0.62	0.14
Nickel	Spring	15	0.54	0.12
Zinc	Fall	14	2.2	0.89
Zinc	Spring	15	4.0	3.9

Table 1B. Power for comparison of Northport dissolved metal data to CCC, with alpha=0.05

Analyte	Season	Sample Size						
		2	3	4	5	6	7	8
Arsenic	Fall	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cadmium	Fall	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Cadmium	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Copper	Fall	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Copper	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead	Fall	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nickel	Fall	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nickel	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Zinc	Fall	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Zinc	Spring	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Comment No.	Comment	Response to Comment - Proposed Revision
QAC1	Update Sections A6.1.3, B1.4 and associated Sampling Event Tables and Schedules to be consistent with the current schedule.	The text and sampling event tables and schedules will be revised to be consistent with the current schedule.
QAC2	Page B-12, section B4.1.2 line 24 – extraction for pesticide using pressurized fluid extraction (method 3545) is not consistent with the methods listed in Table B-1 Method 3510C or Method 3520C. Please update the text or the Table so that the extraction method is clear and consistent throughout the document.	The text will be revised to be consistent with the methods indicated in Table B-1.
QAC3	Include in the QAPP that “All pesticide analyses will be performed in accordance to EPA Region 10 Guidance for Data Deliverables for Laboratories Utilizing SW 846 Method 8081 for Pesticides. Pesticide detections will be confirmed using the gas chromatography/ mass spectrometry (GC/MS) analysis when concentrations are 1 mg/kg or above.	Teck assumes that the comment is relevant to expression of concentrations on an mg/L basis, not an mg/kg basis as stated. The text will be incorporated to section B4.1.2, Organic Compounds, as follows, "Pesticides will be extracted from samples using seperatory funnel or continuous liquid-liquid extraction. Samples will be analyzed by gas chromatography with an electron capture detector (GC/ECD) according to EPA Method 8081B. In addition, pesticide detections will be confirmed by gas chromatography/mass spectrometry (GC/MS) when sample concentrations are 1 mg/L or greater."
QAC4	Page B-21, section B9. Non-direct measurements – Briefly discuss the process that will be used to evaluate the quality of the historical data for UCR RI/FS use.	Historical data will be evaluated on the basis developed during Phase 1 of the RI/FS in which evaluated such data on a number of quality assurance/quality control (QA/QC) measures such as traceability comparability, sample integrity, and availability of laboratory QC data. Based on this evaluation the data is categorized in one of four categories (e.g., Category 1 – data of known quality. For the surface water program data quality will be based on achievement of the DQOs specified in the SW QAPP. Specifically, this will include an evaluation of sample collection techniques (including precautions to minimize contamination), analytical methods and related detection limits, the age of the data, and the sampling and analytical records associated with the data.
QAC5	Page B-23, section B10.2, Laboratory Data, state in the QAPP in what format the data will be prepared. Also state how long the laboratory will archive the electronic instrument data output.	The following text will be added to Section B10.2 The laboratories will archive all hardcopy and electronic instrument data for a period of ten years. A detailed description of procedures for laboratory data management and data review and verification is provided in the laboratory QA plans (Appendix F). Laboratory data will be prepared in hardcopy, PDF, and EDD formats.
QAC6	Page C-1, section C1. Assessment and Response Actions– State the external quality system and technical assessments that will be conducted prior to the award of the contract to the laboratories (if any) and/or lab accreditation. Include the submission of blind SRM, replicates and split samples from the field for lab performance evaluation and other QA samples and oversight activities that are planned during the implementation phase of the project. Include the necessary documentation that will be maintained in the field and the laboratory to (1) document necessary deviations from the approved QAPP (Sample Alteration Form) and (2) project corrective action report and resolutions (Corrective Action Form).	Comment acknowledged and further information regarding laboratory accreditation and external system and quality assessment descriptions will be included in the referenced sections. From an accreditation standpoint, laboratories contracted for the UCR RI/FS are National Environmental Laboratory Accreditation Conference (NELAC) accredited for the applicable/available methods/analytes of interest. In addition, many of the initial activities referenced have been completed. Specifically, prior to contract laboratory award, each laboratory was audited by Environmental Standards, Inc., (ES) to perform independent QA oversight over the sampling analytical and data management activities for the UCR RI/FS. The referenced laboratory audits were designed to assess the laboratories capabilities. Copies of the audit results can be made available upon request. Based on audit results, each laboratory was requested to perform corrective action measures to address the audit findings and provide a formal corrective action response. Additionally, prior to laboratory contract awards, ES executed an aqueous single-blind performance evaluation (PE) study [Columbia Analytical Services, Inc. Kelso, WA for various wet chemistry and total metals analytes and Frontier Geosciences, Inc. Seattle, WA for speciated arsenic]. The recoveries reported by the aforementioned laboratories were within the limits designated by the PE provider (except one marginal outlier for silica). Copies of the PE's can also be made available upon request. With regard to on-going quality assessments, additional text will be included regarding independent QA oversight activities which will include periodic submission of blind PEs, duplicates, replicates (co-located) and inter-laboratory split samples (originating from the field to the laboratories), periodic audits of field sampling teams as well as periodic audits of the project data management activities. Text will also be added that describes the documentation and reporting format that will be used in the event there are necessary (or inadvertent) deviations from the approved QAPP. For reporting and tracking purposes, a Sample Alteration form and Corrective action form will be included in the plan and text will be added to describe the use of these forms.

Comment No.	Comment	Response to Comment - Proposed Revision
QAC7	Page C-3, section C2. Reports to Management, line 6 – Add the word “validatable” data packages and EDDs ... On line 11 – add “and associated electronic instrument output data files in PDF formats” will be provided to EPA within 90 days	The requested text will be added to line 6. Text will also be revised to indicate that the first two data packages will be submitted to the EPA in PDF format and additional packages will be submitted at the EPA's request.
QAC8	Page-D4, section D1. Data review, validation and verification – Add the “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use”, EPA540-R08-005, January, 2009 in the list of guidance used for this section. Note that this document is being provided electronically in PDF format, via email with the PDF version of this comment letter. We would be happy to provide a paper copy upon request.	Teck has obtained the guidance document, <i>Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (USEPA 2009)</i> . This guidance document will be added to the bulleted list of guidance documents for data validation in Section D.1 as requested.
QAC9	Page D5, section D2. Verification and Validation Methods – Revise this section to state that “the first two data packages for each suite of analysis (approximately 10% of the data) will undergo a Stage 4 data manual and electronic validation (SV4EM) and the rest of the data will undergo a stage 2B electronic and manual data validation (SV2BEM). List the Stages 2B and 4 verification and validation checks that will be performed by an independent data reviewer as listed in the guidance. Include a list of data validation deliverables that the validation firm will submit after validation.	<p>Comment acknowledged and the text will be revised to indicate that “the first two data packages for each suite of analysis (approximately 10% of the data) will undergo a Stage 4 data validation (SV4EM) and the remaining laboratory data will undergo Stage 2B data verification (SV2BEM)”.</p> <p>The verification and validation checks associated with the Stage 2B and 4 efforts, being will be listed in the text The revised text will also specify the ES data validation deliverables that will be provided .</p>
QAC10	Table B-1 – Chloride, fluoride and sulfide Method 300.0 HT -- should be 28 days instead of 48 hours; nitrate-nitrite –EPA 300.0 preserved at 4C is 48 hours instead of 28 days. Combined nitrate/nitrite preserved with H2SO4 increases the HT to 28 days.	The requested changes to chloride, fluoride, and sulfide holding times will be made in the text. Teck appreciates the suggestion for the potential for increased holding time for nitrate-nitrite using the suggested method and will ensure the appropriate holding time is listed based on the method employed.
QAC11	Table B-1 -the RBC and ACG listed for Total PCB is in TEQ – this could not be calculated using Method 8082. This is one reason EPA is requiring that Teck use PCB congener method 1668A.	Comment acknowledged; the table will be revised with the appropriate method for achieving the PCB ACG: PCB congener method 1668A.
QAC12	The 2005 National recommended Water Quality Criteria for 2, 3, 7, 8-TCDD is 5 x 10-9 µg/L. There are no ACGs or RBCs listed in the QAPP, and the MDLs and MRLs listed or PCDD/PCDFs are 3-4 orders of magnitude higher than the water quality criteria. Please revisit the proposed method, as modifications may be needed to generate dioxin and furan data that can be support the human health risk assessment.	It is acknowledged that the MDLs/ MRLs listed for PCDD/PCDF compound are higher than 2005 National Recommended Water Quality Criteria (WQC) value for 2, 3, 7, 8-TCDD; however, the PCDD/PCDF methods listed in the QAPP represent the most current State-of-the-Art <u>validated</u> analytical methods for PCDD/PCDF analysis. It should be noted that the underlying basis of the WQC 2, 3, 7, 8-TCDD value is the derived biomagnification factor for aquatic organisms residing in the applicable surface water bodies. Essentially, the WQC value is based on theoretical magnification of 2, 3, 7, 8-TCDD up the food chain beginning with the exposure of test aquatic species residing in surface waters. In this regard, during the UCR RI/FS, we will perform biota sampling and analysis (including PCDD/PCDF compounds) on benthic organisms through and including upper tropic level fish. We are confident that these analyses will provide more suitable and defensible measurement data regarding potential exposure to (and magnification of) PCDD/PCDF compounds, thereby minimizing the concern for surface water analytical sensitivity, which is already in the part per quadrillion (ppq) range.